

Remarks

Claims 1–18 and 29–55 are pending in this application. Claims 8–9, 14–15, and 37 have been amended to make editorial changes and to address the examiners rejection. The amended claims are fully supported by the specification. No new matter has been added.

Section 112 Rejection

Claims 8, 9, and 14 have been amended and the examiner's rejection should be withdrawn.

More specifically, claim 8 recites “multiple prongs to be positioned and aligned so that all catalyst throughout *die that are desired for seeding growth* are irradiated in multiple irradiating periods” (emphasis added). As discussed in the application at, for example, paragraph 3, the catalyst is deposited selectively on one or more dies using patterning. A pattern may include an entire die or multiple dies or specific regions or areas within a die. A person of skill in the art will generally recognize a nanotube or even multiple nanotubes are quite small relative to the size of a die. The catalyst will catalyze growth of the carbon nanotubes at the patterned locations which may be, depending on the circumstances, within a die, an entire die, or multiple dies. Applicants believe claim 8 particularly points out and distinctly claims the subject matter of the invention. Therefore, the rejection should be withdrawn.

For claim 9, the rejection should be similarly withdrawn.

Provisional Double Patenting Rejection

Applicants will defer responding to the examiner's provisional double patenting rejection until the conflicting claims in the cited copending patent application, in fact, issue.

Section 103 Rejection

Claims 1-18 were rejected under section 103 as being unpatentable over U.S. patent 6,756,026 (Colbert) in view of U.S. patent 6,110,291 (Haruta) and U.S. patent publication 2004/0087116 (Nakayama). Reconsideration of the rejection and allowance of the claims are respectfully requested.

No Suggestion to Combine Colbert, Haruta, and Nakayama

There is no suggestion that Colbert, Haruta, and Nakayama should be combined. These references are very dissimilar. Colbert discusses a method of growing carbon fiber from single carbon nanotube molecular arrays. Colbert applies heat to only a growing tip of a fiber. See column 26, lines 35–38. Haruta discusses forming thin films (completely unlike carbon fibers) by using laser ablation (using multiple laser beams) of a solid target to form a gaseous precursor material (“plumes”). Nakayama discusses when manufacturing a semiconductor device, using a laser to heat and melt a semiconductor material, where a magnetic may be optionally be used during this process.

Colbert and Haruta teach away from each other. At column 26, lines 35–38, Colbert states that “the only heat supplied for the growth reaction should be focused at the growing tip of the fiber.” And at column 26, lines 34–36, Colbert states “it is not necessary or preferred to preheat the carbon feedstock gas, since unwanted pyrolysis at the reactor walls can be minimize thereby.” The Colbert approach discourages heating more than just a fiber tip and is completely the opposite of Haruta’s approach of laser ablating a target to form a gaseous precursor material.

Further, Nakayama is very different from either Colbert or Haruta, or both, in that the laser is directed at a semiconductor solid material in order to melt the semiconductor solid, rather to effect a carbon fiber growth. Also, a magnetic field (which is optional) is used to affect the flow of the melted solid so the crystals in the melted solid are altered. See Nakayama, abstract and paragraph 22. It is clear that combining Nakayama with either Colbert or Haruta, or both, will not effect carbon fiber growth.

Therefore, there is no motivation to combine these references, especially in the way the examiner suggests. The examiner has not made a showing of obviousness. For at least this reason, the claims should be allowable.

Combination Falls Short

Even if Colbert were combined with Haruta and Nakayama, and there is no suggestion to do this for the reason stated above, the combination will still fall short of invention as recited in the claim.

The combination of Colbert, Haruta, and Nakayama would be to apply multiple laser beams to a growing tip of a fiber. Further, there would be melting of a solid material (fiber tip) while applying a magnetic field, which will affects the melted portion resulting crystal structure

when cooled down. Clearly, the combination of Colbert, Haruta, and Nakayama do not show or suggest each and every limitation each claim.

Claim 1

Specifically, claim 1 recites “a radiating-energy source, positioned above the stage *to locally heat the catalyst on at least one die via simultaneously emitted multiple prongs of radiating energy.*” The cited references, considered individually or in combination, do not show or suggest locally heating the catalyst on at least one die. As discussed above, the cited references do not show or suggest heating of a die of a workpiece. In particular, Colbert heats a fiber tip, Haruta heats a solid target for ablation, and Nakayama heats a solid material to melt it. The combination of these references does not show or suggest heating using multiple prongs of radiating energy to locally heat a catalyst. Rather these references use multiple beams to ablate (i.e., to remove or destroy) or melt (to alter from a solid to a liquid state). Certainly, the claimed invention is very different from the combination of the cited references.

The invention provides a technique for enhancing the manufacturability of nanostructure-based devices not provided by the prior art. For at least this additional reason, claim 1 should be allowable.

Claims 2–18 are dependent on claim 1 and should be allowable for at least similar reasons as claim 1. These claims recite additional limitations which further distinguish the invention over the prior art.

For example, claim 6 recites that the radiating energy source includes “*focused infrared.*” The cited references do not show or suggest the use of focused infrared radiation. Claim 6 should be allowable for this additional reason.

Claim 15 recites “the stage includes a *stage temperature-control unit for helping to control a temperature of a workpiece.*” As discussed above, Colbert discusses only heating the growing tip. Any other heating or cooling is discouraged. The cited references do not teach or suggest the features recited in this claims. Therefore, claim 15 should be allowable for this additional reason.

Claim 16 recites “the stage temperature-control unit *cools the workpiece to a temperature in a range from an equilibrium room temperature to –250 degrees centigrade.*” Nowhere do the prior art references show or suggest this feature of the invention. Claim 16 should be allowable for this additional reason.

Claim 17 recites “the stage temperature-control unit *heats the workpiece to a temperature in a range from an equilibrium room temperature to 1200 degrees centigrade.*” Nowhere do the prior art references show or suggest this feature of the invention. Claim 17 should be allowable for this additional reason.

Claim 29

Claim 29 recites “a temperature control unit, coupled to the stage, to maintain the stage and the workpiece at a *first temperature*” (emphasis added).

Claim 29 further recites “a radiating energy source, above the stage, to locally heat the catalyst of a selected work region to a *second temperature*, above the first temperature, via multiple prongs of radiating energy” (emphasis added).

Claim 29 further recites “*a feedstock delivery system* for delivery of feedstock gas to the catalyst” (emphasis added).

Nowhere does the cited reference teach or suggest the recited features the invention. The combination of Colbert, Haruta, and Nakayama do not show or suggest a first temperature and a second temperature, where the second temperature is above the first temperature. There is further no showing or suggestion of a feedstock delivery system. For at least this reason, claim 29 should be allowable.

Claims 30–55 are dependent on claim 29 and should be allowable for at least similar reasons as claim 29. These claims recite additional limitations which further distinguish the invention over the prior art.

Claim 32 recites “wherein the temperature control unit cools the stage to the first temperature.” The combination of Colbert, Haruta, and Nakayama do not show or suggest cooling. Claim 32 should be allowable for this additional reason.

Claim 37 recites “wherein an output nozzle of the feedstock delivery system is movable to position above the stage.” The combination of Colbert, Haruta, and Nakayama do not show or suggest an output nozzle of the feedstock delivery system that is movable. Claim 37 should be allowable for this additional reason.

Claim 38 recites “wherein the feedstock delivery system comprises a heating element to heat the feedstock gas to a third temperature before exposing the catalyst to the feedstock gas.” The combination of Colbert, Haruta, and Nakayama do not show or suggest a *third temperature*. Claim 38 should be allowable for this additional reason.

Claim 46 recites “wherein the first, second, and third temperatures are set independently of each other.” The combination of Colbert, Haruta, and Nakayama do not show or suggest this. Claim 46 should be allowable for this additional reason.

Claim 50 recites “an electric field generator, *having an adjustable position relative to the stage*, whereby the electric field generated by the generator will influence a direction of nanostructure growth in the selected work region.” The combination of Colbert, Haruta, and Nakayama do not show or suggest where the electric field generator has an adjustable position. With an adjustable position, angles (for example) may be changed or adjusted as desired, which will influence a direction of nanostructure growth. This feature is not provided by the prior art. Furthermore, the magnetic field, by way of a magnet, in Nakayama is not the same as an electric field of the invention. Claim 50 should be allowable for this additional reason.

Conclusion

For the above reasons, applicants believe all claims now pending in this application are in condition for allowance. Applicants respectfully request that a timely Notice of Allowance be issued in this case. If the examiner believes a telephone conference would expedite prosecution of this application, please contact the signee.

Respectfully submitted,

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